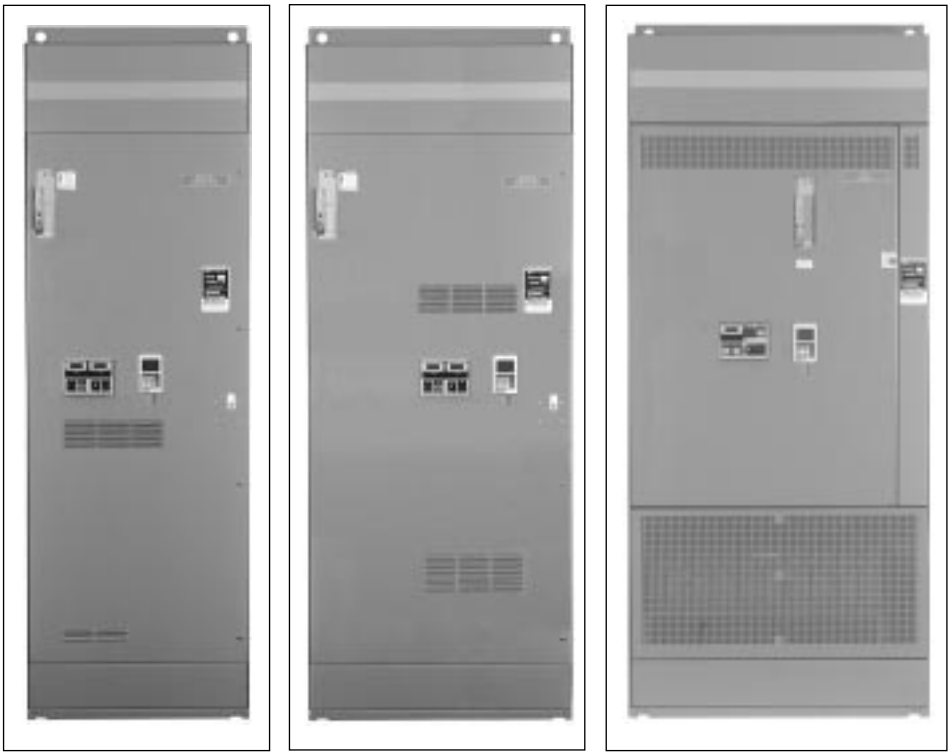
Instruction Bulletin
80442-507-01A
February 1998



ALTIVAR™ Drive Controller Units In Class 8998 Motor Control Centers

Installation and Maintenance Manual

50–350 HP Constant Torque
50–75 HP Variable Torque Low Noise
60–400 HP Variable Torque

SQUARE D

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SECTION 1—INTRODUCTION

This document is an addendum to two manuals:

1. *Class 8998, Motor Control Center Instruction Bulletin for Model 6*
   Bulletin number: 8998IM9201R1/93, dated February 1994
2. *Class 8998, Motor Control Center Installation and Maintenance Manual for Model 5*
   Bulletin number: 8998IM9101R5/92, dated May 1992

Several features of ALTIVAR drive controller units differ from standard Motor Control Centers (MCC). The purpose of this document is to provide necessary information for initial installation and maintenance of MCCs with ALTIVAR drive controller units.

Reference documents were shipped with equipment for ALTIVAR drive controller units and MCCs. These documents are listed below:

- *Model 6 Motor Control Center Instruction Bulletin, Class 8998*
  Bulletin number: 8998IM9201R1/93, dated February 1994

  –or–

  Model 5 Motor Control Center Installation and Maintenance Manual, Class 8998
  Bulletin number: 8998IM9101R5/92, dated May 1992
  NOTE: These two bulletins are referred to herein as "MCC instruction bulletin."
- A*LTIVAR 66 Receiving, Installation, and Start-up Instruction Bulletin*
  Bulletin number: VDOC06S304C, dated December 1996

  –or–

  ALTIVAR 56 User's Manual
  Bulletin number: 50006-519-01B, dated December 1996
- *ALTIVAR 66 Level 1 and 2 Configuration Instruction Bulletin*
  Bulletin number: VDOC06S305C, dated November 1996
- *ALTIVAR 66 I/O Extension Module and Level 3 Configuration Instruction Bulletin*
  Bulletin number: VDOC06T306, dated September 1995
  NOTE: Included in package only if I/O extension module was provided.
- Drawings specific to the order

To replace missing documents, contact your local Square D field office.

The Square D motor control center ALTIVAR drive controller unit consists of a pre-engineered motor control center unit with disconnect and an ALTIVAR ac drive controller for adjustable speed control of standard 3-phase asynchronous motors.

Each MCC drive controller unit contains current limiting fuses to achieve the short circuit rating of the unit. Each unit also contains a cooling system for thermal management. Various control and power contactor options may be included with the unit. Drawings shipped with the unit list all included options.

The ALTIVAR drive controller is factory set for use in most common applications. Many settings are programmed according to the power or control options ordered with the MCC drive controller unit and should not be adjusted. To adjust the drive controller for a particular installation, refer to the drawings included with the order and to the *ALTIVAR 66 Level 1 and 2 Configuration Instruction Bulletin* or ALTIVAR 56 user's manual (listed above).

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SECTION 2—SAFETY PRECAUTIONS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION.

- Turn OFF all power supplying this equipment before working on or inside the motor control center. Equipment must be de-energized during all installation and maintenance operations.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Use a properly rated voltage sensing device to confirm that all power is off.
- After disconnecting power, wait one minute before servicing a drive controller in order to allow the dc bus capacitors to discharge. After one minute, measure the dc bus capacitor voltage between the "+" and "–" terminals to verify that dc voltage is less than 45 Vdc. The dc bus LED is not an accurate indication of the absence of dc bus voltage. For additional information, refer to page 51 of the Altivar 66 Receiving, Installation, and Startup Manual (VD0C06S304A, Dec. 1996) or ALTIVAR 56 User's Manual (50006-519-01B, Dec. 1996).
- Do not short across dc bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in the drive controller—including printed wiring boards—operate at line voltage. Do not touch. Use only electrically insulated tools.
- Use out-of-service tags and padlocks when working on equipment. Leave the tags in place if you leave the area or until the work is completed and the equipment is ready for service.
- Use only test equipment rated for the service intended.
- All personnel involved in handling, installation, testing, operation, and maintenance should be thoroughly familiar with the information in this instruction bulletin and the reference documents listed on page 1 of this bulletin before working on this equipment. Personnel must have a thorough understanding of electrical equipment in general, the specific operation of this particular equipment, and the types and severity of potential injury.
- Follow all applicable OSHA 29 CFR Part 1910, NFPA 70E Part II, and any other applicable local standards and regulations before working on this equipment.
- Personnel must also be trained in the proper use of appropriate protective equipment.

Failure to observe these precautions will result in death, severe personal injury, or equipment damage.

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SECTION 3—RECEIVING, HANDLING AND STORAGE

Refer to the appropriate MCC instruction bulletin (Model 5 or Model 6) for information about receiving, handling, and storage of MCC units and enclosures.

Before installing MCC control units, locate and tighten any connections loosened during shipment and handling. Refer to the procedures in the Maintenance section of the appropriate MCC instruction bulletin (Model 5 or Model 6).

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SECTION 4—INSTALLATION

This section contains installation details specific to MCC ALTIVAR drive controller units. For details specific to MCC installation, refer to the "INSTALLATION" section in the appropriate MCC Model 5 or Model 6 instruction bulletin.

UNIT IDENTIFICATION

Refer to the Unit Identification label located on the inside wall of the MCC drive controller unit for the unit identification information. Also, on the inside wall of the MCC drive controller unit is the drive unit rating label (see Figure 1, Figure 2, or Figure 3). In addition to the labels mentioned above, each ALTIVAR drive controller has a rating label on the right side of the drive controller. This label contains, among other items of information, the ALTIVAR drive controller catalog number (e.g. ATV**N4U).

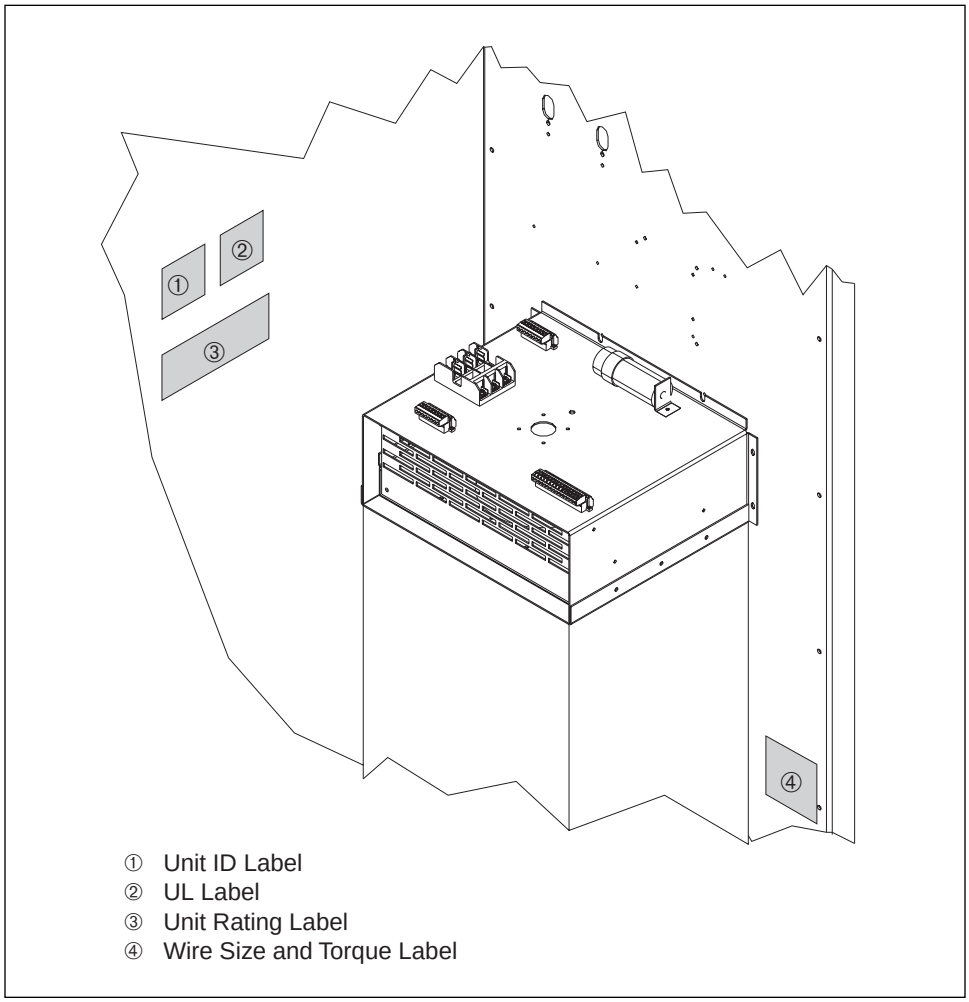

Figure 1: Unit label locations for Frame Size 5 basic unit

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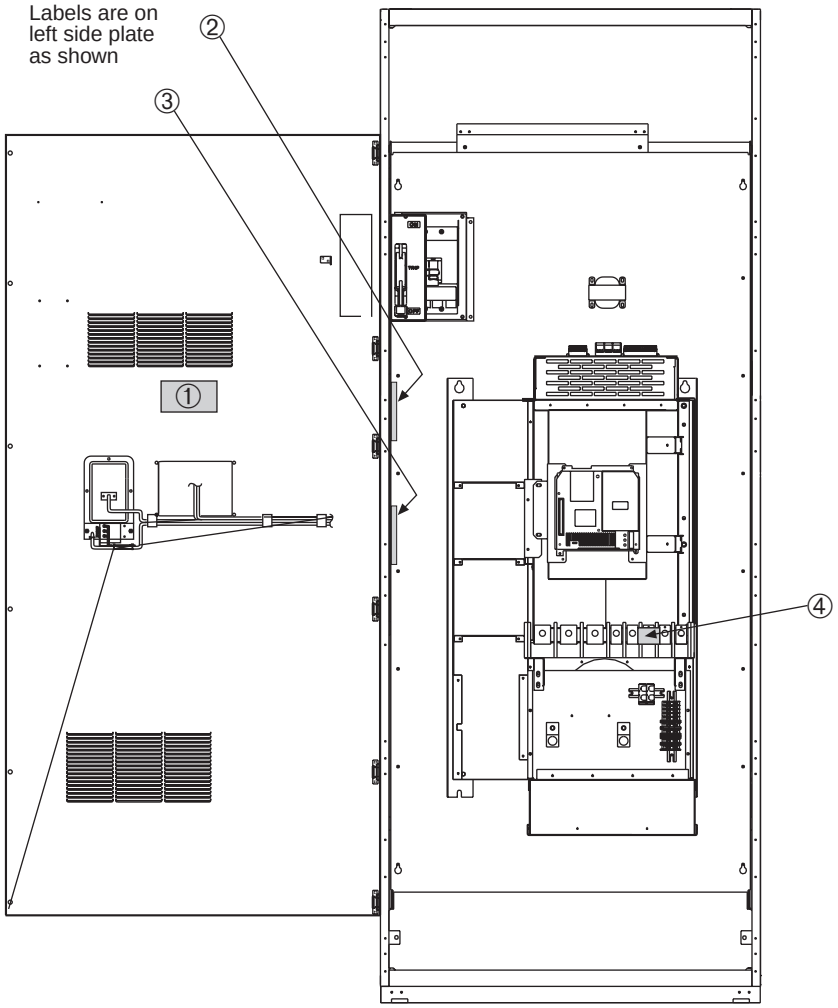

① Unit Rating Label
② UL Label
③ Unit ID Label
④ Wire Size and Torque Label

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UNIT IDENTIFICATION (cont.)

Figure 2: Unit label locations for Frame Size 6 basic unit

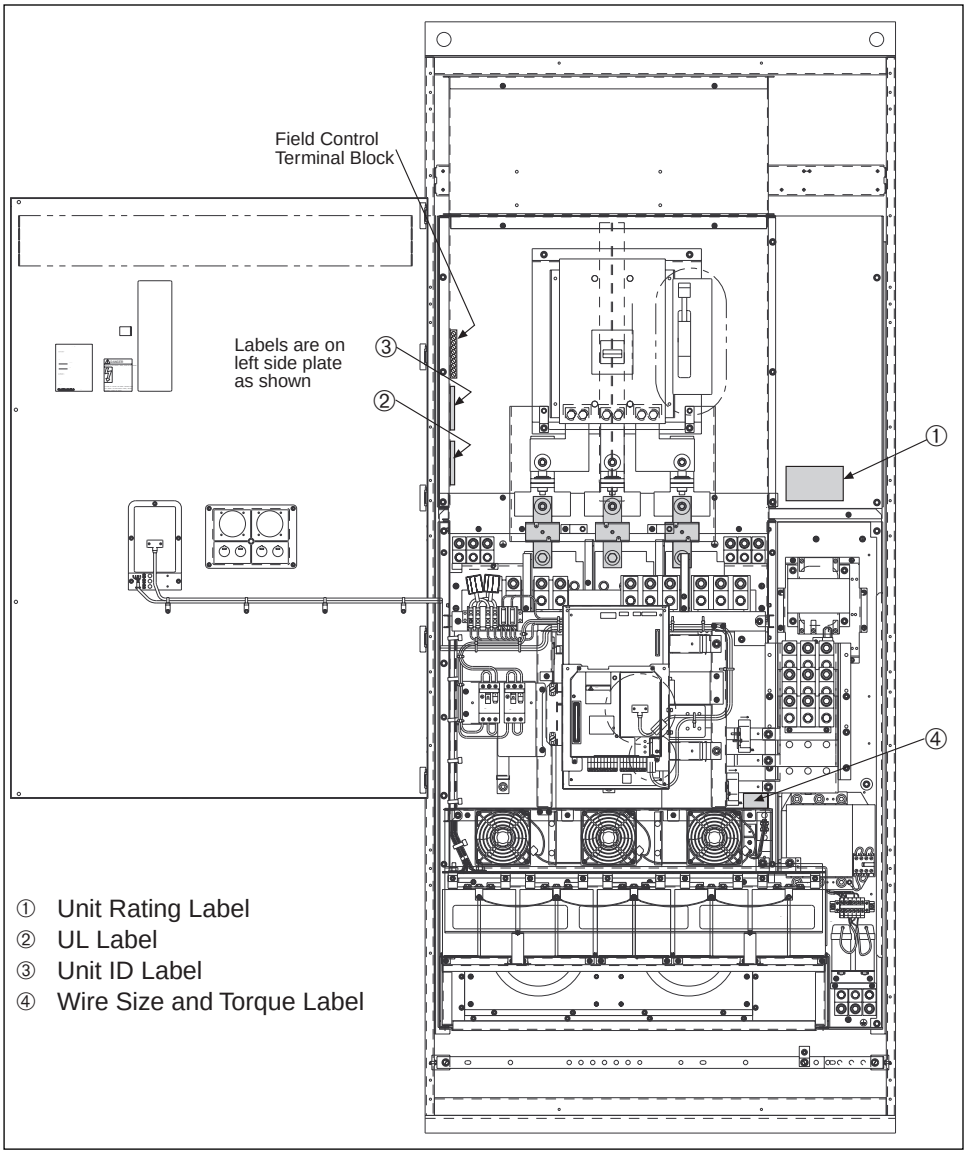

Figure 3: Field Control Terminal Block and Unit label locations for Frame Size 7 basic unit

CONTROL AND LOAD WIRING

On Frame Sizes 5 and 6, pull-apart terminals for field control wiring are mounted on top of the air discharge duct (Figure 4). On Frame Size 7, pull-apart terminals for field control wiring are mounted on the upper left side (Figure 3). Terminate field control wiring on the removable portion of the block (Figure 5).

NOTE: Depending on power and control options ordered, several analog or digital inputs and outputs are available at the control terminal blocks on the ALTIVAR drive controller. Refer to the wiring diagram supplied with the MCC drive controller unit for I/O availability. Refer to the ALTIVAR drive controller configuration instruction bulletins (listed on page 1) for I/O specifications and adjustments.

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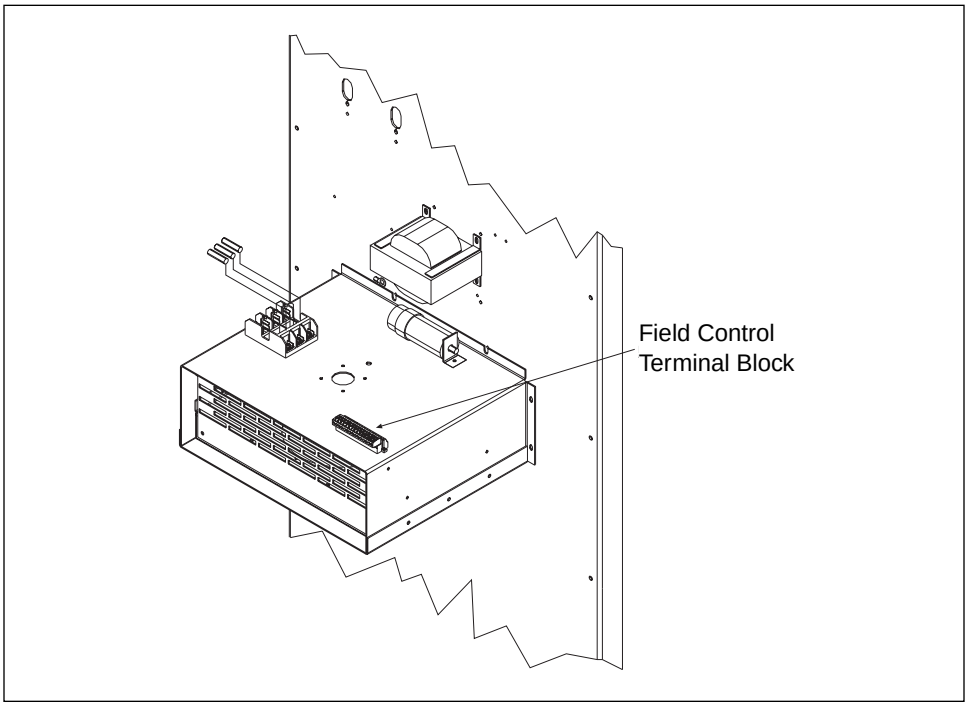
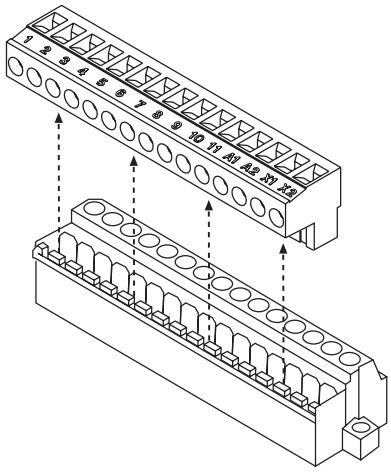


Figure 4: Field Control Terminal Block location (Sizes 5 and 6)



10 A Control Wire Terminal Block

To separate or remove the top portion of the terminal block from the base, grasp the top half and pull apart as shown.

Each terminal is rated for one 16–12 AWG wire or two 16 AWG wires.

Torque terminal screws to 5 lb-in.

The terminal block is designated “FTB” on the wiring diagram associated with the unit and in the figures of this bulletin.

Figure 5: Field Control Terminal Block

If a barriered bypass is supplied, additional pull-apart type terminal blocks are provided in the bypass starter. Some control schemes require connection to the terminal blocks in the bypass starter for field control wiring. In this instance the wiring diagram designates the terminal blocks as “FTB” in the bypass starter location.

CABLE CONNECTION TORQUE VALUES

Refer to the torque label inside the drive controller unit for load-terminal wire and torque requirements. See Figure 1 on page 4, Figure 2 on page 6, or Figure 3 on page 6 for exact location on basic units. The label is near the user connection point on other configurations with power contactor options installed.

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WIRE ROUTING AND INTERCONNECTION

The controller Field Wiring Termination information in "APPENDIX B—FIELD WIRING TERMINATION DRAWINGS" on page 26, provides the required torque and maximum allowable wire size for each field wiring terminal. This information also provides requirements for the Wire Class, Noise Class, and Voltage Class of the field connected conductors. These classes are described below.

Wire Class

Compatibility of the field wiring terminal with the conductor material and insulation system are described by Wire Class. When used with the required conductor current rating and controller-rated ambient temperature, the Wire Class forms the basis for the selection of a conductor size, which limits the temperature on the conductor insulation at the field wiring terminal to an acceptable range. Conductors with operating temperatures exceeding those specified by the Wire Class may be used, but the conductor size must be selected based on Wire Class limits.

Noise Class

Electromagnetic properties of the voltages and currents present are categorized by Noise Class. Wiring is classified into the following six noise classes for selection of wiring methods and physical segregation purposes.

Quiet Wiring 1 (QW1)

High susceptibility analog and digital control signals.

Signals in this classification include digital communication and network circuits, controller analog input/output (I/O), and analog process signals.

Quiet Wiring 2 (QW2)

Medium susceptibility, analog, and digital control signals.

Signals in this classification include 24 volt dc and ac control circuits.

Standard Wiring 1 (SW1)

Low susceptibility control or power circuits rated less than 600 Vac (250 Vdc) and less than 15 A. NOTE: Voltage and current spectra are generally contained within 0.05–9 kHz.

Signals in this classification include 120 Vac control circuits.

Standard Wiring 2 (SW2)

Power circuits rated greater than 15 A. NOTE: Voltage and current spectra are generally contained within 0.05–9 kHz.

Signals falling under this classification include line power to controllers.

Standard Wiring 3 (SW3)

Reserved.

Pulse Wiring 1 (PW1)

Control or power circuits whose voltage or current spectra significantly exceed 9 kHz.

Signals in this classification include motor and dynamic braking circuits fed from pulse width modulated (PWM) power converters.

Voltage Class

The voltages present at the field wiring terminals are categorized by Voltage Class. Voltage is classified into recognized conductor insulation categories (30 V, 150 V, 300 V, and 600 V) for the selection of conductor insulation voltage rating and physical segregation purposes.

Based on the noise class and voltage class of the conductors, apply the wiring methods listed in Table 1 to the drive system.

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Table 1: Wire Routing and Interconnection

Wiring Methods and Considerations	**Noise Class of Conductors**				
	QW1	QW2	SW1	SW2	PW1
Conductor Grouping in Wireways/Conduits					
1. All conductors of a 1- or 3-phase power circuit must be bundled to minimize stray magnetic fields.			X	X	X
2. All conductors of a dc power circuit must be bundled to minimize stray magnetic fields.			X	X	X
3. When paralleled conductors must be run in separate wireways or conduit. Minimize stray magnetic fields by bundling the conductors into groups.				X	X
4. Maintain conductor runs short as practical.	X	X	X	X	X
Separation of Circuits					
1. DO NOT run different Noise Class conductors in the same conduit.	X	X	X	X	X
2. DO NOT run different Voltage Class conductors in the same conduit unless all conductors are insulated for maximum Voltage Class present.	X	X	X	X	X
3. Outside the enclosure, all PW conductor groups must be individually segregated using metallic conduit.					X
4. Segregate all conductors by Noise Class. Use the following circuit separation when conductors can run parallel for more than 12 inches:					
• Metallic conduit: 3 inches between QW to SW/PW	X	X	X	X	X
• Metallic tray: 3 inches between SW and PW			X	X	X
• Metallic tray: 6 inches between QW and SW/PW	X	X	X	X	X
• Against continuous metal surface: 3 inches between SW and PW			X	X	X
• Against continuous metal surface: 6 inches between QW and SW/PW	X	X	X	X	X
• Metallic conduit housing of QW: 12 inches to non-metallic conduit SW/PW	X	X	X	X	X
• Non-metallic conduit: 3 inches between SW and PW			X	X	X
• Non-metallic conduit: 24 inches between QW to SW/PW	X	X	X	X	X
5. If QW and SW wiring must cross SW2 or PW1 wiring, the bundles must cross at right angles.	X	X	X	X	X
Common Mode Noise Issues					
1. Provide adjacent signal returns using twisted pair cable.	X	X			
2. Galvanically isolate signal and associated signal return path when possible.	X	X			
Shielding					
1. Use metallic conduit for all power and control circuits external to the controller enclosure.	X	X	X	X	X
2. Shields should be continuous and equipped with a drain wire.	X	X	X		
3. DO NOT group different Noise Class conductors within the same shield.	X	X	X	X	X
4. Minimize the non-shielded portion of conductor at the ends of shielded cable.	X	X	X	X	X
5. When shielding ac or dc power conductors, group conductors to minimize magnetic field in shield.			X	X	X
Grounding					
1. Ground shields at one end only (controller end).	X	X	X	X	X
2. Use separate ground wire for each shield ground.	X	X	X	X	X
3. Provide a ground wire with all conductor groups whether in tray or conduit.			X	X	X
4. When multiple grounds must be made to a shielded power cable, the shield must have the same short circuit withstand capability as the ground conductor in the power cable.			X	X	X
5. Terminate all power grounds and shield ground s to the controller grounding point or bar.			X	X	X
6. Terminate all signal shield grounds to the terminals provided.	X	X			
7. Always supply a separate equipment grounding conductor with the controller power feed. DO NOT depend upon metallic conduit for ground connection.			X	X	X

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SECTION 5—OPERATION

⚠WARNING

UNINTENDED EQUIPMENT ACTION.

- Read and understand the *ALTIVAR 66 Level 1 and 2 Configuration Instruction Bulletin* (VD0C06S305C) or ALTIVAR 56 User's Manual (50006-519-01B) before using the keypad display.
- Lock keypad after making parameter adjustments.
- Do not reset drive parameters to configurations other than those specified on the parameter sheets supplied by Square D with the drive controller. Some factory-set drive parameters are critical for MCC drive controller unit control and power configurations.
- Do not alter programming of factory installed control devices or power contactors.

Failure to observe these precautions can result in death, severe personal injury, or equipment damage.

NOTE: Before operating the drive controller, perform the procedures listed in Factory Settings (below).

For complete information about MCC ALTIVAR drive controller unit operation, refer to *ALTIVAR 66 Level 1 and 2 Configuration Instruction Bulletin* (VD0C06S305C) or ALTIVAR 56 User's Manual (50006-519-01B) and any drawings supplied with the unit.

If an I/O extension module was provided, refer to *ALTIVAR 66 I/O Extension Module and Level 3 Configuration Instruction Bulletin* (VD0C06T306) or ALTIVAR 56 User's Manual (50006-519-01B) for operation information.

FACTORY SETTINGS

The ALTIVAR drive controller is software driven. The drive controller unit has been pre-programmed to match the power and control options purchased with the MCC drive controller unit.

NOTE: Do not change the factory-set parameters as indicated on the parameter sheet(s) supplied with the MCC drive controller unit. Several settings are critical to unit control and power configurations.

For information on these settings, refer to the ALTIVAR Parameter Sheets included with your shipment in the packet labeled "Installation/Maintenance Information." (A sample parameter sheet is shown in Appendix A.)

NOTE: For factory settings, refer only to the ALTIVAR parameter sheet(s) shipped with your package. These parameters supercede any parameter information shown in other ALTIVAR drive controller documentation.

The following key parameters should be checked and adjusted prior to motor operation:

1) Nominal Current

2) Motor Overload

The drive controller is equipped with a number of control algorithms and features for flexibility in application. Self-tuning is incorporated into several of the control algorithms to allow optimal control of the motor.

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If the drive controller has been configured as Normal Torque or High Torque control type, follow these precautions:

- The adjustment range of the Nominal Current parameter is 45% to 105% of the drive controller rated output current. This allows the use of motors of equal horsepower size or one horsepower size less than the drive controller horsepower rating. To adjust the Nominal Current parameter, refer to the *ALTIVAR 66 Level 1 and 2 Configuration Instruction Bulletin* (VD0C06S305C, December 1996) or ALTIVAR 56 User's Manual (50006-519-01B, December 1996).
- Before powering up for the first time, compare the motor-nameplate current rating with the output current in:

  ALTIVAR 66:
  Table 1, Table 2, or Table 3 (depending on the drive controller Torque Type setting) in *ALTIVAR 66 Receiving, Installation, and Start-up Instruction Bulletin* (VD0C06S304C, December 1996).

  –or–

  ALTIVAR 56:
  Table 1 or Table 2 (depending on the drive controller Torque Type Setting) in ALTIVAR 56 User's Manual (50006-519-01B, December 1996).

  If the motor rating is not within 45% to 105% of the value in the table, a different drive controller must be used.

⚠ CAUTION

MOTOR OVERHEATING.

Do not use motors with a full load current rating that is not within the adjustment range of the drive controller Nominal Current parameter.

Failure to observe these precautions can result in severe personal injury or equipment damage.

- Each time an ALTIVAR 66 drive controller is powered up with Normal or High Torque control type selected, direct current equal to the drive controller rated current is injected into the motor. This allows the drive controller to determine the resistance of the motor and set the motor parameters.
- For optimal torque performance, the drive controller and motor should be operated under no load at 50/60 Hz during initial commissioning or any time the motor is changed. This allows the drive controller to measure key motor parameters.
- The Nominal Current parameter must be set on the drive controller keypad display to match the motor full load current rating. If the Nominal Current parameter cannot be adjusted to the motor full load current, Normal and High Torque control types cannot be used for the application.
- **For applications using multiple motors, contact the factory**.

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SECTION 6—MAINTENANCE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION.

- Turn OFF all power supplying this equipment before working on or inside a motor control center.
- The unit disconnect switch must be in the OFF position before installation or removal of power fuses.
- Use a properly rated voltmeter to check that all circuits are de-energized.
- Control units must be de-energized before maintenance is performed.
- After disconnecting power, wait one minute to allow the dc bus capacitors to discharge. After one minute, measure dc bus capacitor voltage between the "+" and "–" terminals to verify that dc voltage is less than 45 Vdc. The dc bus LED is not an accurate indication of the absence of dc bus voltage. For additional information, refer to page 51 of the *Altivar 66 Receiving, Installation, and Startup Manual* (VD0C06S304C, December 1996) or Altivar 56 User's Manual (50006-519-01B, December 1996).
- Do not short across dc bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.

Failure to observe these precautions will result in death, severe injury, or equipment damage.

Perform maintenance on the MCC drive controller unit a minimum of once per year, or more frequently if indicated by service conditions and your established maintenance policy. Details specific to maintenance of MCC ALTIVAR drive controller units are outlined herein.

Details specific to maintenance of motor control centers are outlined in the Model 5 and Model 6 MCC instruction bulletins.

All maintenance must be performed by qualified personnel.

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POWER FUSE RECOMMENDATION AND LOCATION

Power fuse clips in MCC ALTIVAR drive controller units accommodate either 600 V Class T fuses, 500 V Bussman FWH Series fuses, or 700 V Bussman semiconductor fuses, depending on the unit rating. See Table 2 for the approprate fuse type and mounting location.

NOTE: Every MCC ALTIVAR drive controller unit is shipped with power fuses factory installed.

Table 2: Power Fuse Recommendation and Location

Contstant Torque or Variable Torque (low noise) HP	Variable Torque HP	Drive Frame Size	ALTIVAR Drive Catalog Number (Square D)	Fuse Catalog Number (Bussmann)	Fuse Class	Fuse Ampere Rating	Fuse Location	Square D Part Number
50	—	5	ATV②D54N4U	JJS-125	T	125	Figure 5	25417-21250
—	60	5	ATV②D54N4U	JJS-150	T	150	Figure 5	25417-21250
60	—	5	ATV②D64N4U	JJS-150	T	150	Figure 5	25417-21250
—	75	5	ATV②D64N4U	JJS-175	T	175	Figure 5	25417-21750
75	—	5	ATV②D79N4U	JJS-175	T	175	Figure 5	25417-21750
—	100	5	ATV②D79N4U	JJS-225	T	225	Figure 5	25417-22500
100①	125	6	ATV66C10N4U	FWH-400	—	400	Figure 6	25418-60400
125①	150	6	ATV66C13N4U	FWH-400	—	400	Figure 6	25418-60400
150①	200	6	ATV66C15N4U	FWH-500	—	500	Figure 6	25418-62501
200①	—	6	ATV66C19N4U	FWH-600	—	600	Figure 6	25418-62600
250①	250	7	ATV66C23N4U	170M6711	—	700	Figure 7	25705-00700
—	300	7	ATV66C23N4U	170M6711	—	700	Figure 7	25705-00700
300①	—	7	ATV66C28N4U	170M6712	—	800	Figure 7	25705-00800
—	350	7	ATV66C28N4U	170M6713	—	800	Figure 7	25705-00800
350①	—	7	ATV66C31N4U	170M6713	—	900	Figure 7	25705-00900
—	400	7	ATV66C31N4U	170M6713	—	900	Figure 7	25705-00900

① Variable Torque (low noise) not available.
② ALTIVAR 56 or 66

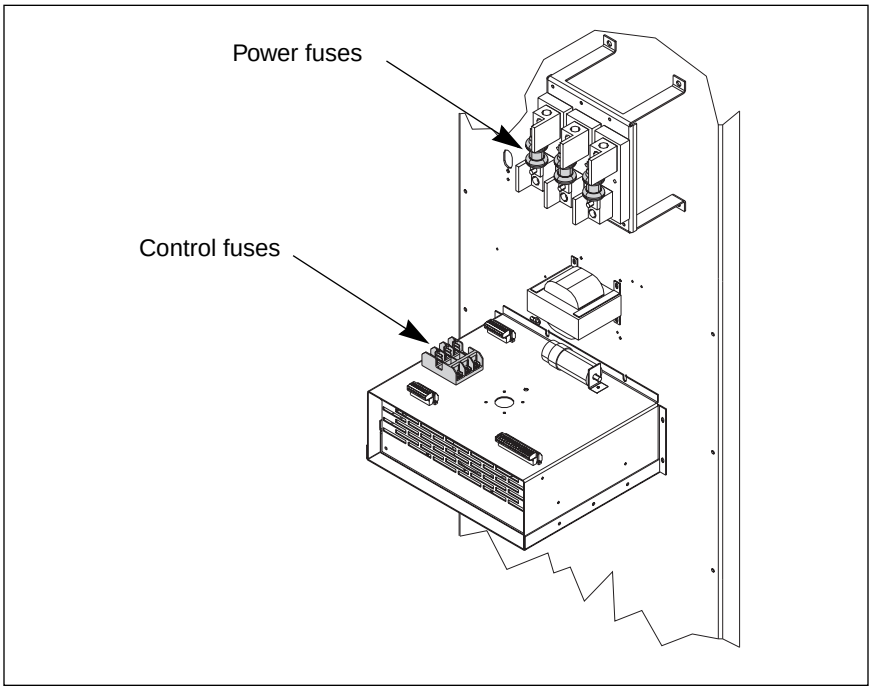

Figure 6: Fuse location for Frame Size 5

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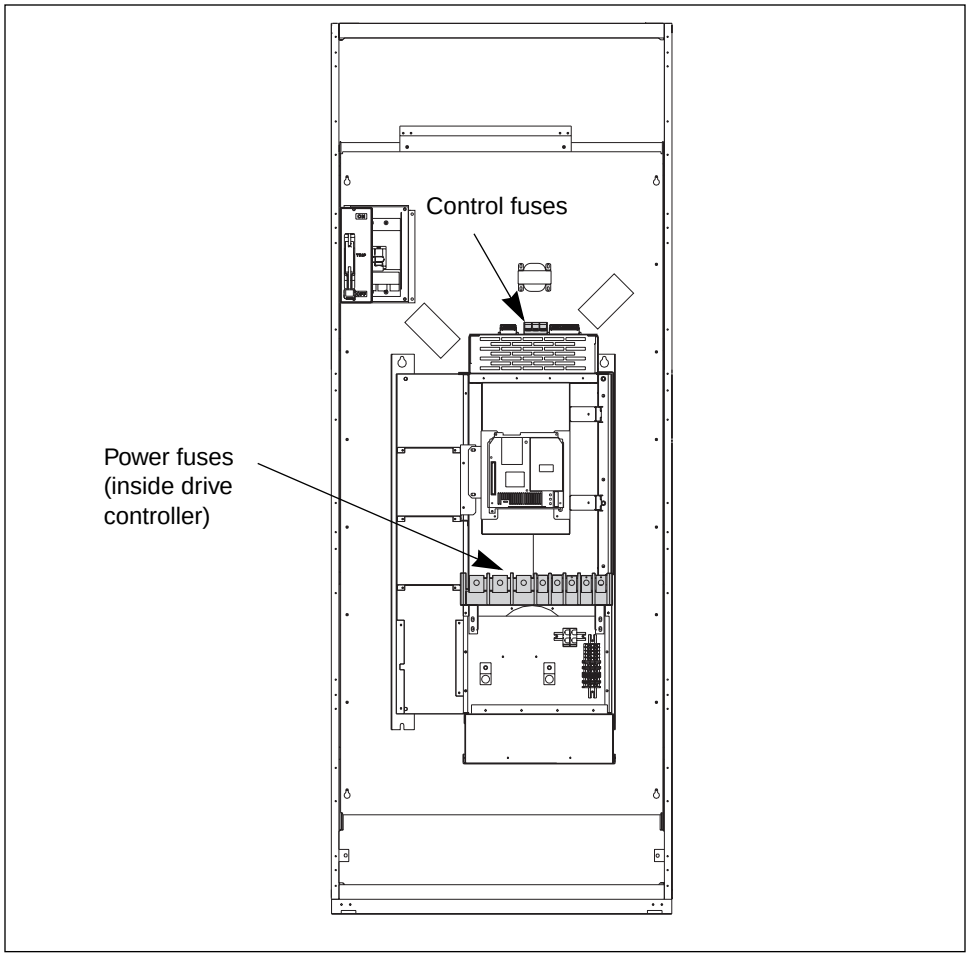

Figure 7: Fuse location for Frame Size 6

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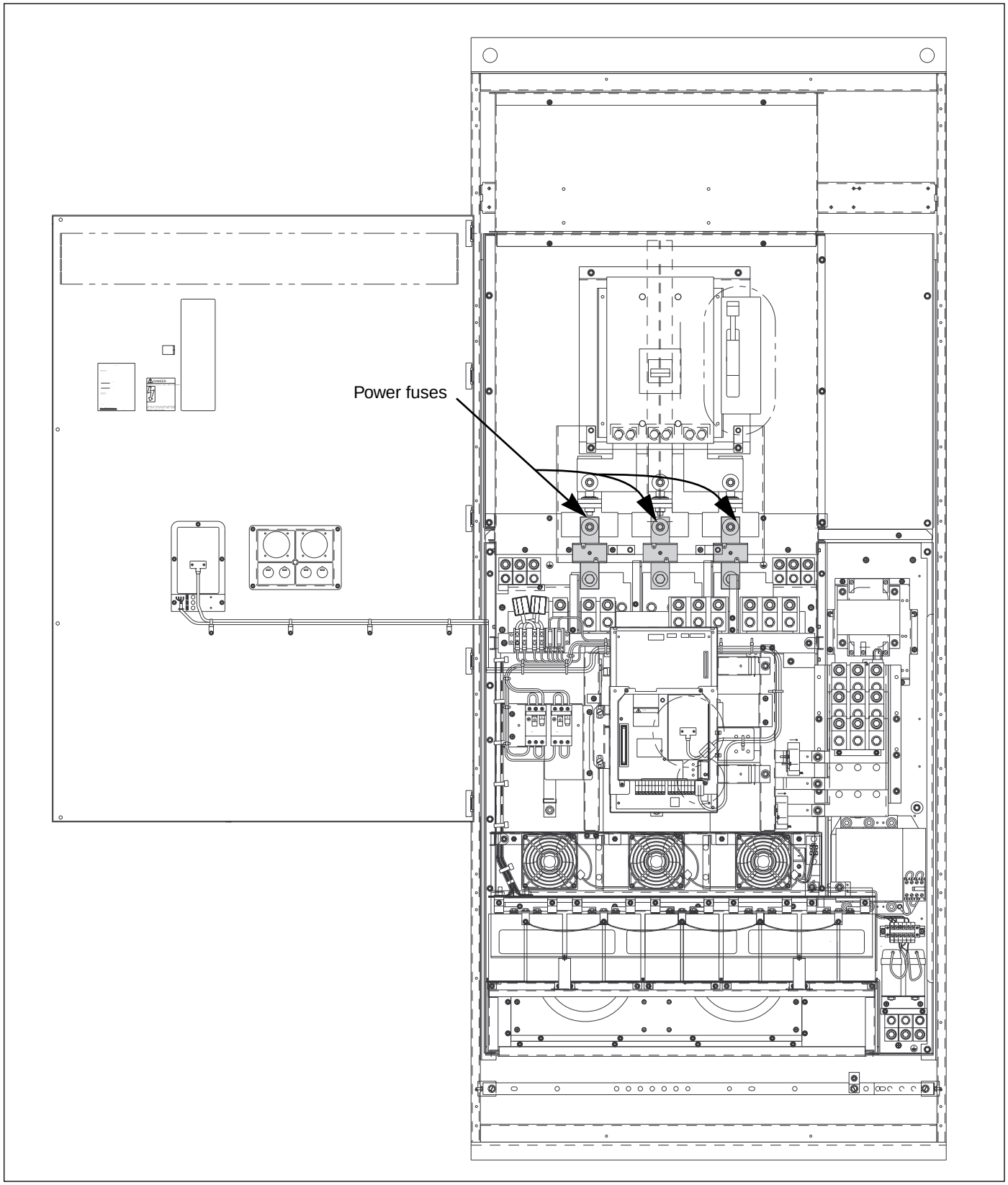

Figure 8: Fuse location for Frame Size 7

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COOLING SYSTEM MAINTENANCE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION.

- Turn off all power supplying the equipment before working inside motor control centers.
- Use a properly rated voltage sensing device to check that all circuits are de-energized. Equipment *must* be de-energized before maintenance is performed.

Failure to observe these precautions will result in death, severe personal injury, or electric shock.

Motorized Impeller Removal

Frame Size 5 units have a cooling system that uses a motorized impeller. A motorized impeller is an air mover that either draws in or exhausts air, and that changes the direction of the air flow at right angles. Frame Sizes 6 and 7 are cooled by other systems, which are described in the ALTIVAR drive component receving, installation, and startup instruction bulletin.

Cooling system air movers do not require any scheduled maintenance. Fan / impeller removal is necessary only when fan / impeller replacement is indicated by troubleshooting (see "TROUBLESHOOTING— DRIVE OVERHEATING" on page 21).

NOTE: All maintenance must be performed by qualified personnel.

Follow these steps should the need arise to remove the motorized impeller in Frame Size 5 units:

1. Disconnect all power supplying the equipment.
2. Remove the motorized impeller wiring from the control wiring terminal block (Figure 9 on page 17).
3. Remove the two screws located in the front of the protective grill and the two screws located on the side of the duct housing (Figure 10 on page 18).
4. Remove the protective grill (Figure 10).
5. Remove the four impeller mounting screws located on top of the duct housing (Figure 10).
6. Remove the motorized impeller through the front of the duct housing. Carefully feed the impeller motor wires through the hole in the top of the duct housing (Figure 11 on page 18).

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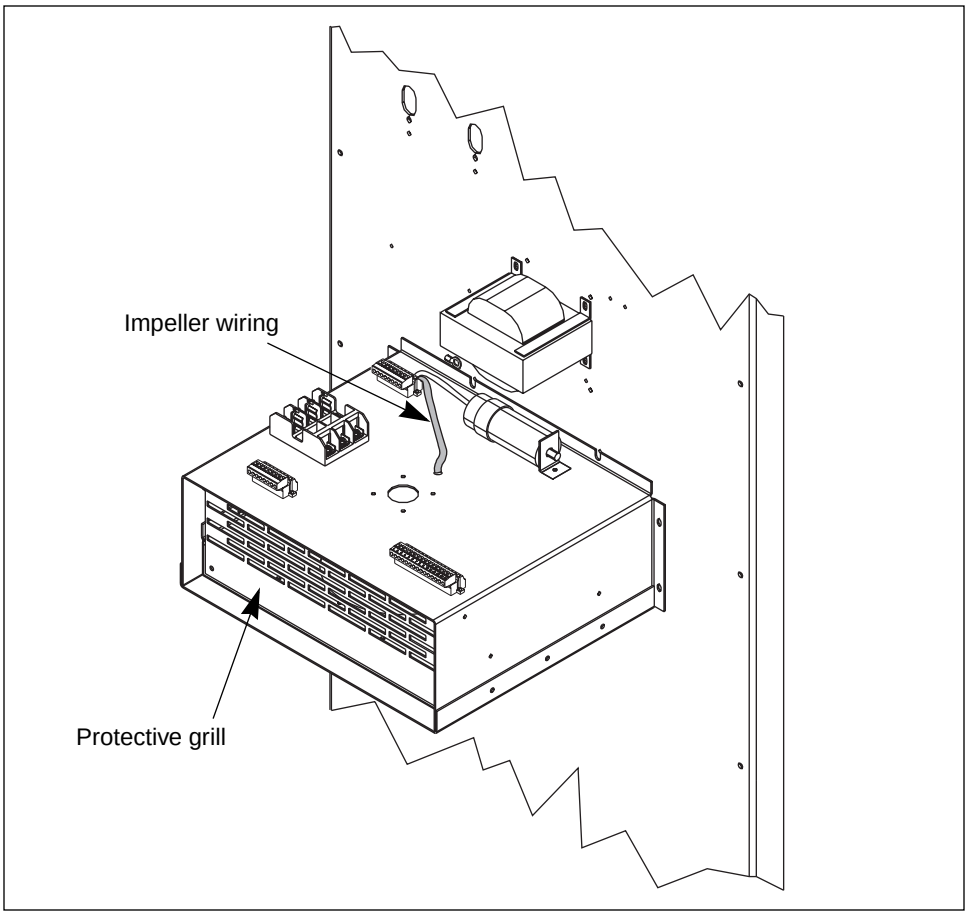

Figure 9: Impeller Wiring Removal

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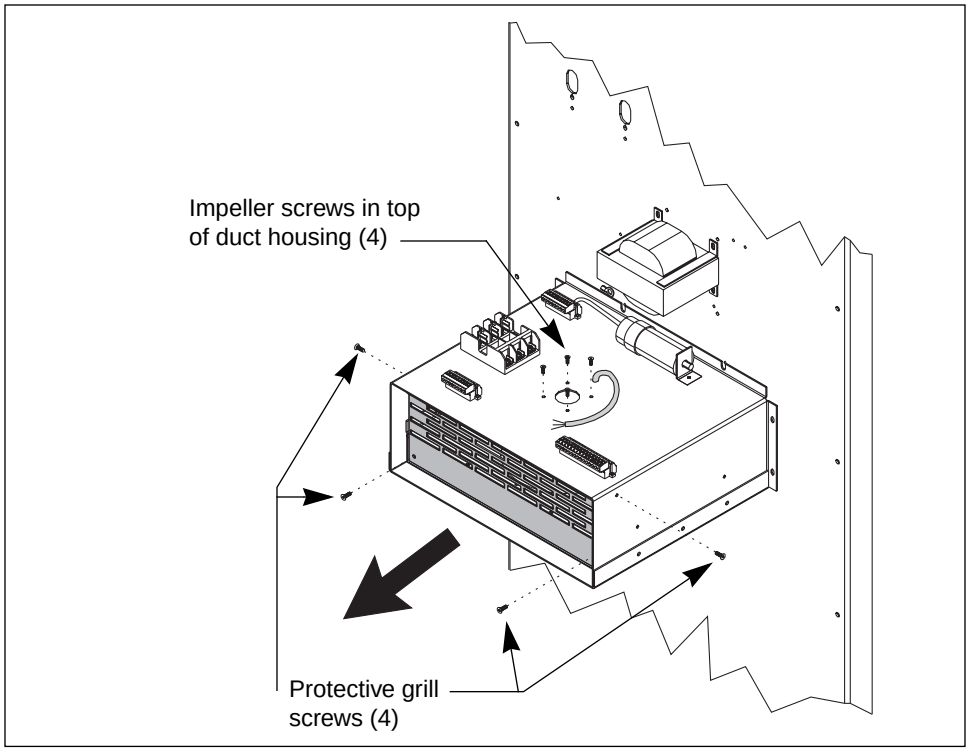

Figure 10: Protective Grill and Impeller Screw Removal

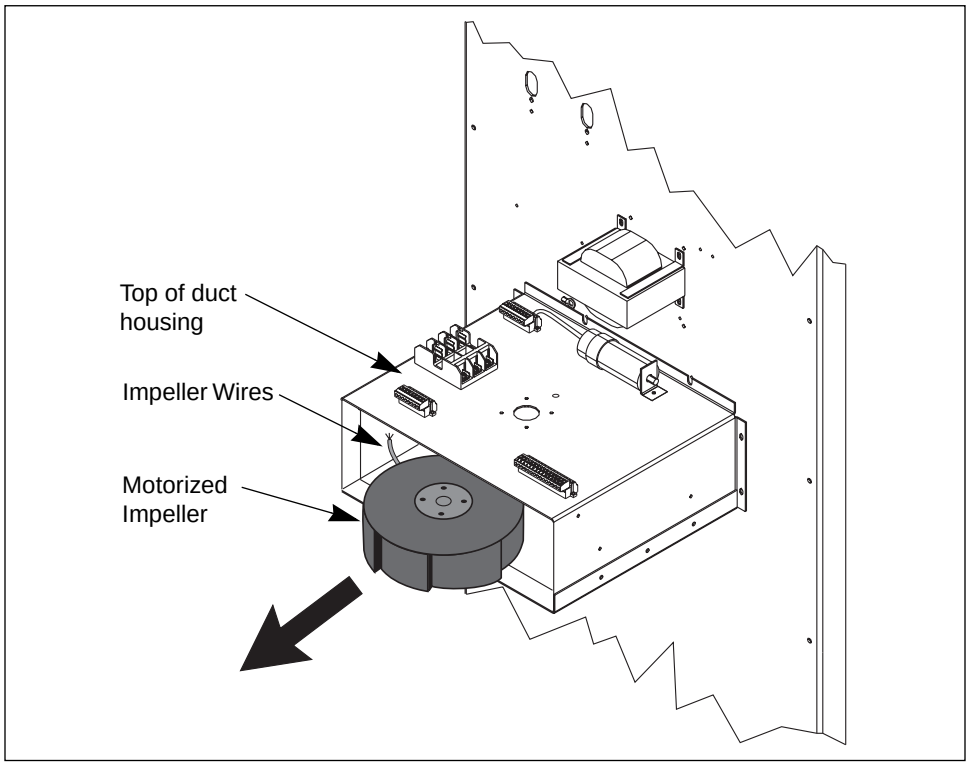

Figure 11: Motorized Impeller Removal

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Motorized Impeller Installation

To install the impeller, which is included only on Frame Size 5 units, follow these instructions:

1. Disconnect all power supplying the equipment.
2. Install the motorized impeller through the front of the duct housing. Carefully feed the impeller motor wires through the hole in the top of the duct housing (Figure 11 on page 18).
3. Install the four impeller mounting screws on top of the duct housing (Figure 10 on page 18).
4. Replace the protective grill (Figure 10).
5. Replace the two screws in the front of the protective grill and the two screws on the side of the duct housing (Figure 10).
6. Insert the motorized impeller wiring into the control wiring terminal block (Figure 9 on page 17). Wires are color coded for proper placement.

DUCT-SYSTEM CLEANING FOR SIZE 5 AND 6 UNITS

In order to ensure proper ventilation of the drive controller unit, periodically clean the duct system using these steps:

1. Remove the top duct cover.
2. Vacuum all of the top and bottom duct areas.
3. Replace the top duct cover when complete.
4. Vacuum all vented openings in the drive controller unit door.

NOTE: Do not use compressed air; it will redistribute contaminants to other surfaces.

DUCT-SYSTEM CLEANING FOR SIZE 7 UNITS

In order to ensure proper ventilation of the drive controller unit, periodically clean the duct system using these steps:

1. Remove the vent plate at the bottom front of the unit (Figure 12). This vent plate covers the inlet duct.
2. Vacuum all of the inlet duct areas.
3. Replace the vent plate when complete.
4. Vacuum all vented openings, including the outlet vent on the top and upper right rear of the unit.

NOTE: Do not use compressed air; it will redistribute contaminants to other surfaces.

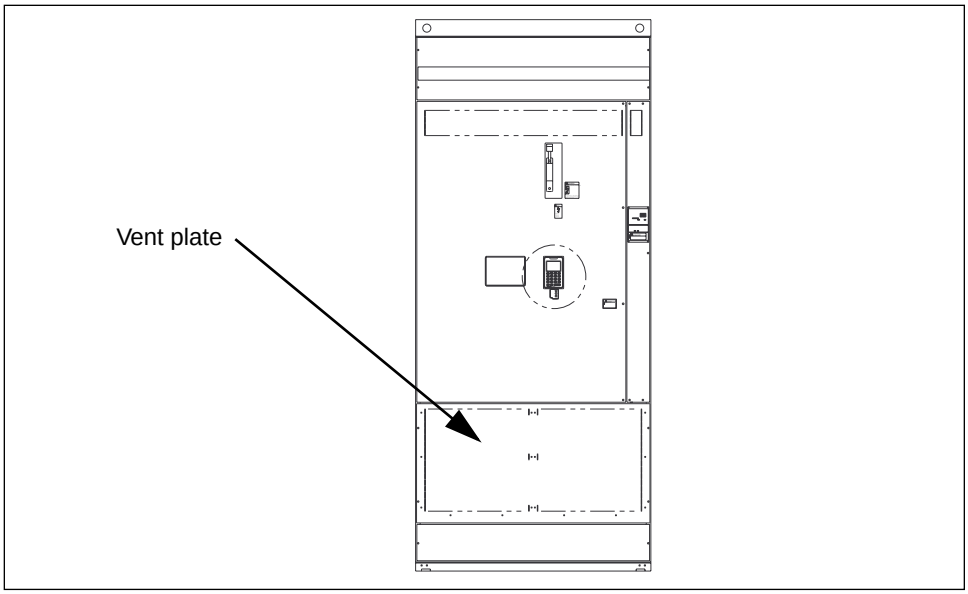

Figure 12: Vent Plate Removal

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INSULATION TEST

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Do not use a megger to test solid-state devices, capacitor units, or any devices that are not designed to withstand megger voltages. Disconnect these devices before testing the rest of the motor control center.

Failure to observe this precaution can result in personal injury or equipment damage.

Refer to the appropriate MCC bulletin (Model 5 or Model 6) for MCC insulation test procedures.

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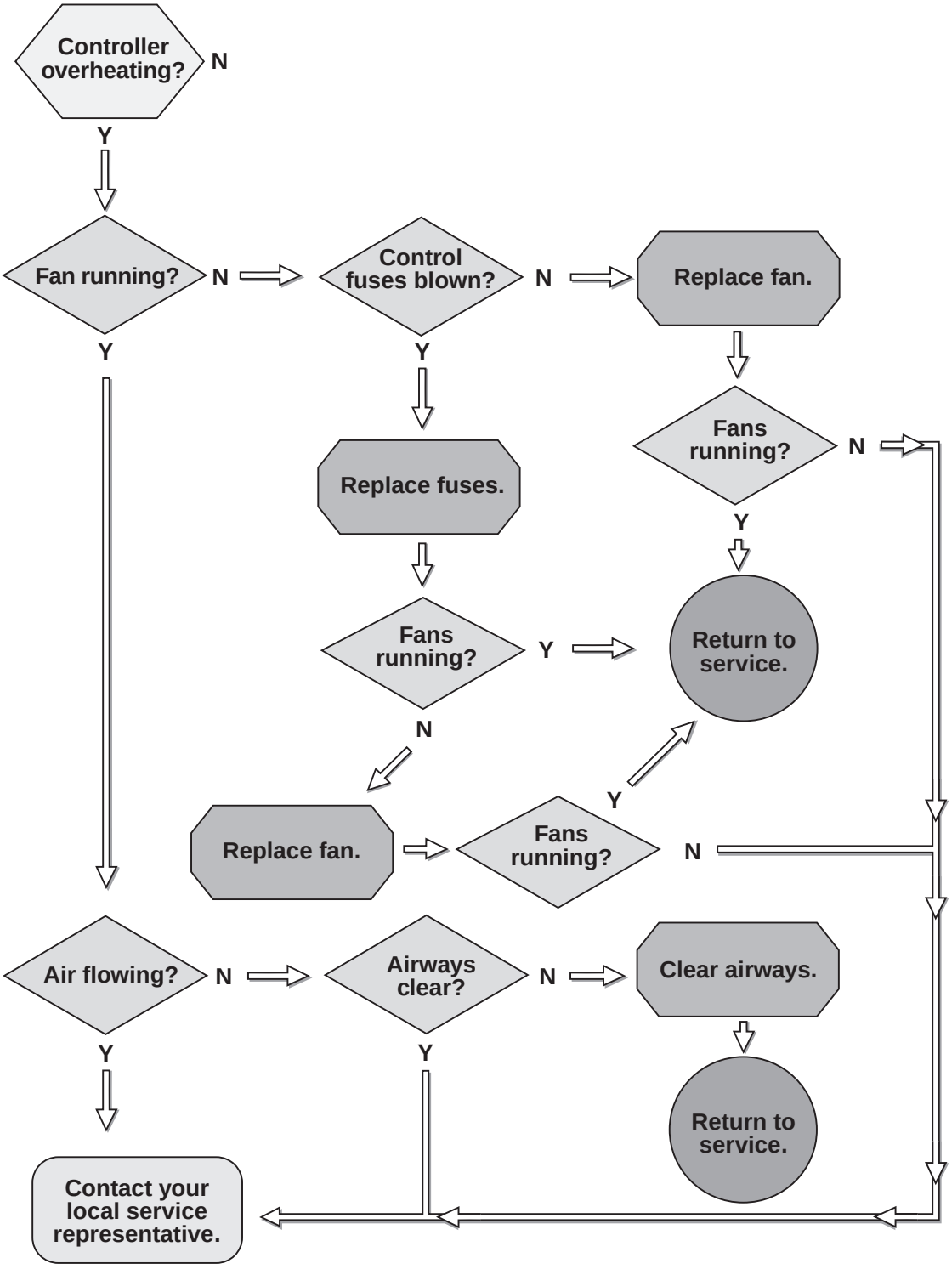
TROUBLESHOOTING—DRIVE OVERHEATING

The following flow chart demonstrates necessary steps to take if the drive overheats.



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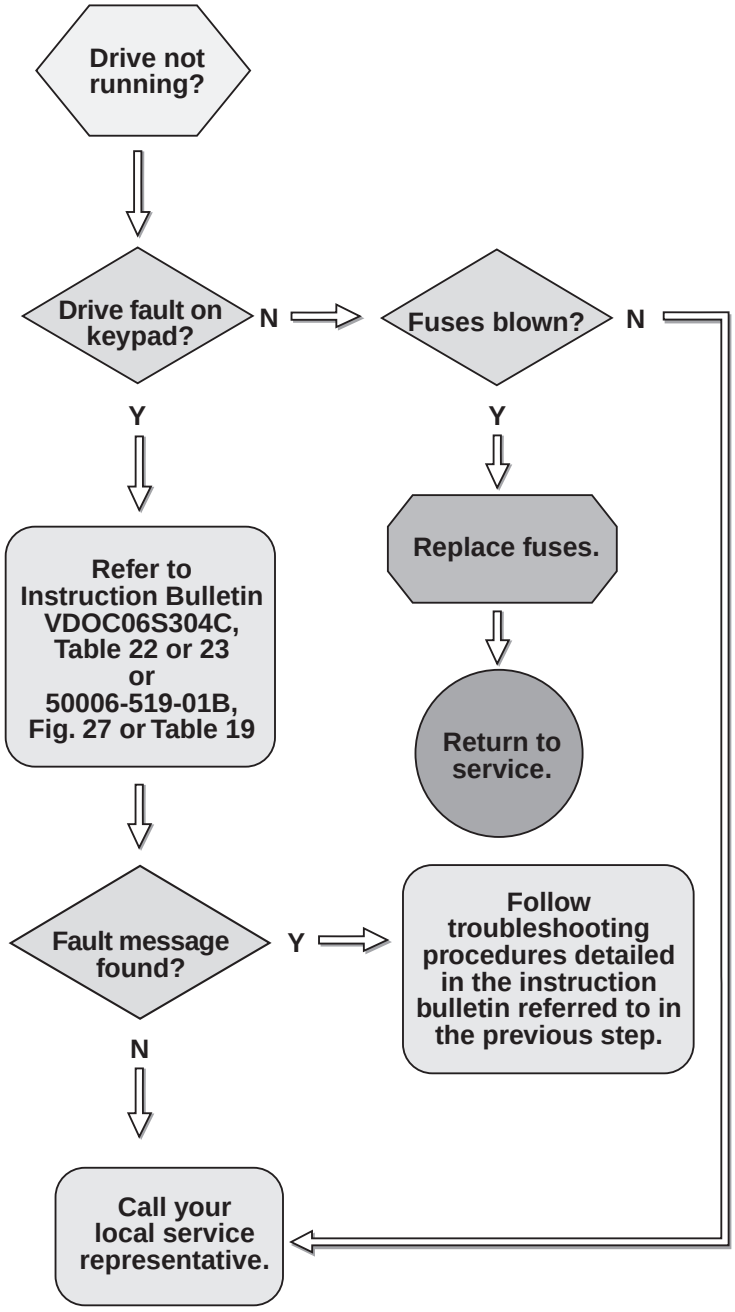
TROUBLESHOOTING—DRIVE WILL NOT RUN

The following flow chart demonstrates necessary steps to take if the drive will not run.



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SPARE PARTS

This section details the spare parts available for ALTIVAR drive controller units in motor control centers. For drive controller spare parts, see Table 24 of Instruction Bulletin VDOC06S304C or Appendix C of ALTIVAR 56 User's Manual (50006-519-01B). For power fuse recommendation and location, refer to Table 2 on page 13 of this manual.

Table 3: Fused Switch Disconnects

Description			Drive Controller	Square D Part Number
CT or VT (low noise) HP at 460 V	VT HP	Drive Frame Size		
50	60	5	ATV66D54N4U	KHL36000M
60	75	5	ATV66D64N4U	KHL36000M
75	100	5	ATV66D79N4U	KHL36000M
100①	—	6	ATV66C10N4U	KAL36250-26M
—	125	6	ATV66C10N4U	KAL36250-30M
125①	—	6	ATV66C13N4U	KAL36250-30M
—	150	6	ATV66C13N4U	LAL36400-32M
150①	—	6	ATV66C15N4U	LAL36400-32M
—	200	6	ATV66C15N4U	LAL36400-35M
200①	—	6	ATV66C19N4U	LAL36400-35M
250①	250–300	7	ATV66C23N4U	MHL360008M
300①	350	7	ATV66C28N4U	MHL360008M
350①	400	7	ATV66C31N4U	MHL360008M

① VT (low noise) not available.

Table 4: Circuit Breaker Disconnects

Description			Drive Controller	Square D Part Number
CT or VT (low noise) HP	VT HP	Drive Frame Size		
50	60	5	ATV66D54N4U	KAL36250-25M
60	75	5	ATV66D64N4U	KAL36250-25M
75	—	5	ATV66D79N4U	KAL36250-25M
—	100	5	ATV66D79N4U	KAL36250-29M
100①	—	6	ATV66C10N4U	KAL36250-26M
—	125	6	ATV66C10N4U	KAL36250-30M
125①	—	6	ATV66C13N4U	KAL36250-30M
—	150	6	ATV66C13N4U	LAL36400-32M
150①	—	6	ATV66C15N4U	LAL36400-32M
—	200	6	ATV66C15N4U	LAL36400-35M
200①	—	6	ATV66C19N4U	LAL36400-35M
250①	250–300	7	ATV66C23N4U	MHL360008M
300①	350	7	ATV66C28N4U	MHL360008M
350①	400	7	ATV66C31N4U	MHL360008M

① VT (low noise) not available.

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SPARE PARTS (cont.)

Table 5: CL1 and CL2 Fuses

Rating	Drive Controller	Square D Part Number
KTK-R-3	D54-C15	25430-10300

Table 6: Fan Fuses

Description	Rating	Drive Controller	Square D Part Number
PRI (FF)	FNQ-R-1/4	ATV66 with 50 VA CPT	25430-20025
	FNQ-R-1/2	ATV66 with 100 VA CPT	25430-20050
	FNQ-R-3/4	ATV66 with 150 VA CPT	25430-20074
	FNQ-R-1-6/10	ATV66 with 300 VA CPT	25430-20161
	FNQ-R-2-8/10	ATV66 with 500 VA CPT	25430-20281
	FNQ-R-4	ATV66 with 750 VA CPT	25430-20400
	FNQ-R-5	ATV66 with 1000 VA CPT	25430-20500
SEC (FF)	FNQ-R-1/2	ATV66 with 50 VA CPT	25430-20050
	FNQ-R-8/10	ATV66 with 100 VA CPT	25430-20080
	FNQ-R-1-1/4	ATV66 with 150 VA CPT	25430-20126
	FNQ-R-2-1/2	ATV66 with 300 VA CPT	25430-20250
	FNQ-R-4	ATV66 with 500 VA CPT	25430-20400
	FNQ-R-6 1/4	ATV66 with 750 VA CPT	25430-20625
	FNQ-R-9	ATV66 with 1000 VA CPT	25430-20900

Table 7: Bulbs

Description	Rating	Drive Controller	Square D Part Number
Red LED	24 Vdc	ATV66 All Sizes	25501-03043
Green LED	24 Vdc	ATV66 All Sizes	25501-03044
Yellow LED	24 Vdc	ATV66 All Sizes	25501-03045
Pilot Lamp	120 Vac	ATV66 All Sizes	DL1CE130

Table 8: Air Movers

Description	Size	CFM	Manufacturer	Reference Number	Square D Part Number
Axial Fans	4.69 X 4.69	115	Comair-Rotron	MX2A3	26016-31529
	5.72 X 6.75	235	Comair-Rotron	MR2B3	26016-31528
Motorized Impeller	7.48 diameter	365	EBM Industries	R2E190-AE50-29	26016-31532

Table 9: Meters

Description	Rating	Square D Part Number
Potentometer	2.5 Kohms	80442-273-01
MMIR	24 Vdc	80442-247-50

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APPENDIX A—SAMPLE ALTIVAR PARAMETER SHEET

MENU INDEX NO.	PARAMETER NAME	SETTINGS BY MCC FACTORY
6.1	TORQUE TYPE	VARIABLE (VT)
6.2	COMMAND TYPE	2 WIRE (Maintained)
7.2	SPEED REF 1	AI1
7.2	SPEED REF 2	AI2 4-20mA
7.2	AUTO/MANUAL	YES, LOGIC IN:LI5 AUTO RUN = LI6
7.2	CONTROLLED STOP	BY LOGIC INPUT = LI7 ACTIVE STATE = LOW STOP TYPE = FREE
7.2	BYPASS	YES DEFINE I/O SEQUENCE INPUT = LI8 RUN OUT. COMMAND = R2
7.3	FAULT STATE	LO2
7.3	MOTOR SPEED	AO1 SELECT 0-20mA
7.4	FAULT RESET	LI4

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APPENDIX B—FIELD WIRING TERMINATION DRAWINGS

Table 10: Field Wire Termination Chart for Basic Frame Size 5 Adjustable Frequency Controller in MCCs (see Figure 13 on page 27)
50–75 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
60–100 HP at 460 Vac, Variable Torque (VT)

Termination Designation	Device	Torque (lb-in/N•m)	Maximum Wire Size (AWG/mm^2)	Wire Class	Noise Class	Voltage Class	Applicable HP Ratings
T1, T2, T3	Converter Fuse Block	375 / 43①	250 kcmil②	60° / 75° C CU-AL	SW2	600 V	All
L1, L2, L3	Power Converter	70/9③	#2 / 35③	75° C CU	SW2	600 V	All
T1, T2, T3	Power Converter	70/9③	#2 / 35③	75° C CU	PW1	600 V	All
PA, PB	Power Converter	27 / 3	#2 / 35	75° C CU	PW1	600 V	All
Any	Power Converter J1	3.5 /0.4	#14 / 1.5	75° C CU	SW1	150 V / 300 V	All
Any	Power Converter J12, J22, J24	3.5 / 0.4	#14 / 1.5	75° C CU	QW2	30 V	All
Any	Power Converter J13, J23	3.5 / 0.4	#14 / 1.5	75° C CU	QW1	30 V	All
X1, X2, S1, S2, 1, 2, 3 through n	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	SW1	150 V	All
C1, C2, C3 through Cn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW1	30 V	All
D1, D2, D3 through Dn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW2	30 V	All

① For VT 100 HP — Converter fuse block torque is 500 lb-in / 57 N•m.

② For VT 100 HP — Converter fuse block maximum wire size is 600 kcmil.

③ These are recommended wire sizes and torque. The maximum wire size is #4/0 AWG / 70 mm^2 and the recommended torque for this wire size is 170 lb-in / 19 N•m.

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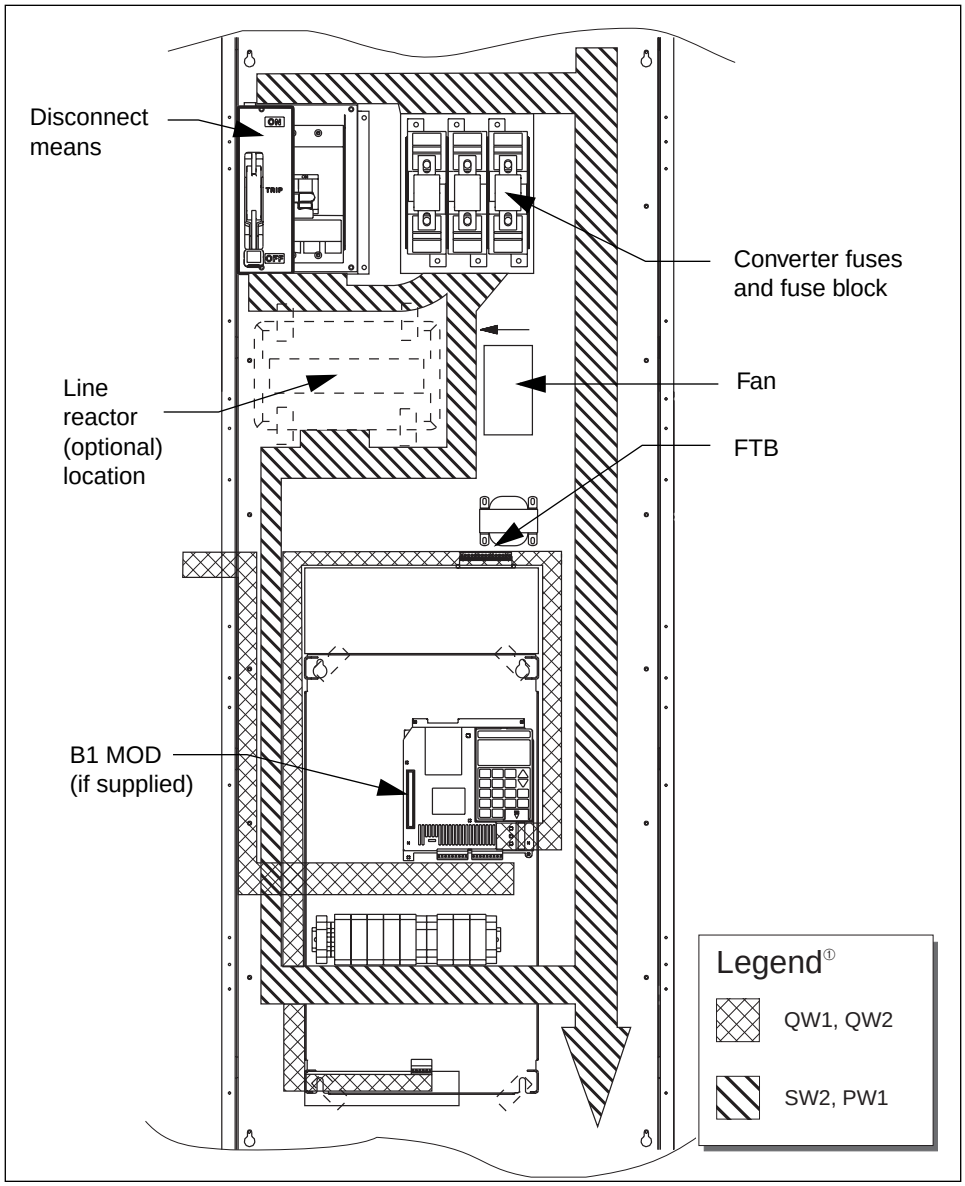

Figure 13: Field Wire Termination for Basic Frame Size 5 Altivar Adjustable Frequency Controller in MCCs
50–75 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
60–100 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to "WIRE ROUTING AND INTERCONNECTION" on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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Table 11: Field Wire Termination for Frame Size 5, Altivar Frequency Controller with Extended Options in MCCs (see Figure 14 on page 29 and Figure 15 on page 30)
50–75 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
60–100 HP at 460 Vac, Variable Torque (VT)

Termination Designation	Device	Torque (lb-in/N•m)	Maximum Wire Size (AWG/mm²)	Wire Class	Noise Class	Voltage Class	Applicable HP Ratings
T1, T2, T3	Converter Fuse Block	375 / 43①	250 MCM	60° / 75° C CU-AL	SW2	600 V	All
L1, L2, L3	Power Converter	70 / 9②	#2 / 35②	75° C CU	SW2	600 V	All
T1, T2, T3	Power Converter	70 / 9②	#2 / 35②	75° C CU	PW1	600 V	All
PA, PB	Power Converter	27 / 3	#2 / 35	75° C CU	PW1	600 V	All
T1, T2, T3	Iso/Bypass Starter of Isolation Contactor (if applicable)	35 / 4	#3 / —	75° C CU	PW1	600 V	50–60 HP
		88 / 10	#1 / —	75° C CU	PW1	600 V	75 HP
		159 / 18	1/0 / —	75° C CU	PW1	600 V	100 HP VT
L1, L2, L3	Line Contactor (if applicable)	88 / 10	2/0 / —	75° C CU	SW2	600 V	50–60 HP
		159 / 18	3/0 / —	75° C CU	SW2	600 V	75–100 HP
Any	Power Converter J1	3.5 /0.4	#14 / 1.5	75° C CU	SW1	150 V / 300 V	All
Any	Power Converter J12, J22, J24	3.5 / 0.4	#14 / 1.5	75° C CU	QW2	30 V	All
Any	Power Converter J13, J23	3.5 / 0.4	#14 / 1.5	75° C CU	QW1	30 V	All
X1, X2, S1, S2, 1, 2, 3 through n	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	SW1	150 V	All
C1, C2, C3 through Cn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW1	30 V	All
D1, D2, D3 through Dn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW2	30 V	All

① For VT 100 HP—Converter fuse block torque is 500 lb-in / 57 N•m.

② These are recommended wire sizes and torque. The maximum wire size is #4/0 AWG / 70 mm² and the recommended torque for this wire size is 170 lb-in / 19 n•m.

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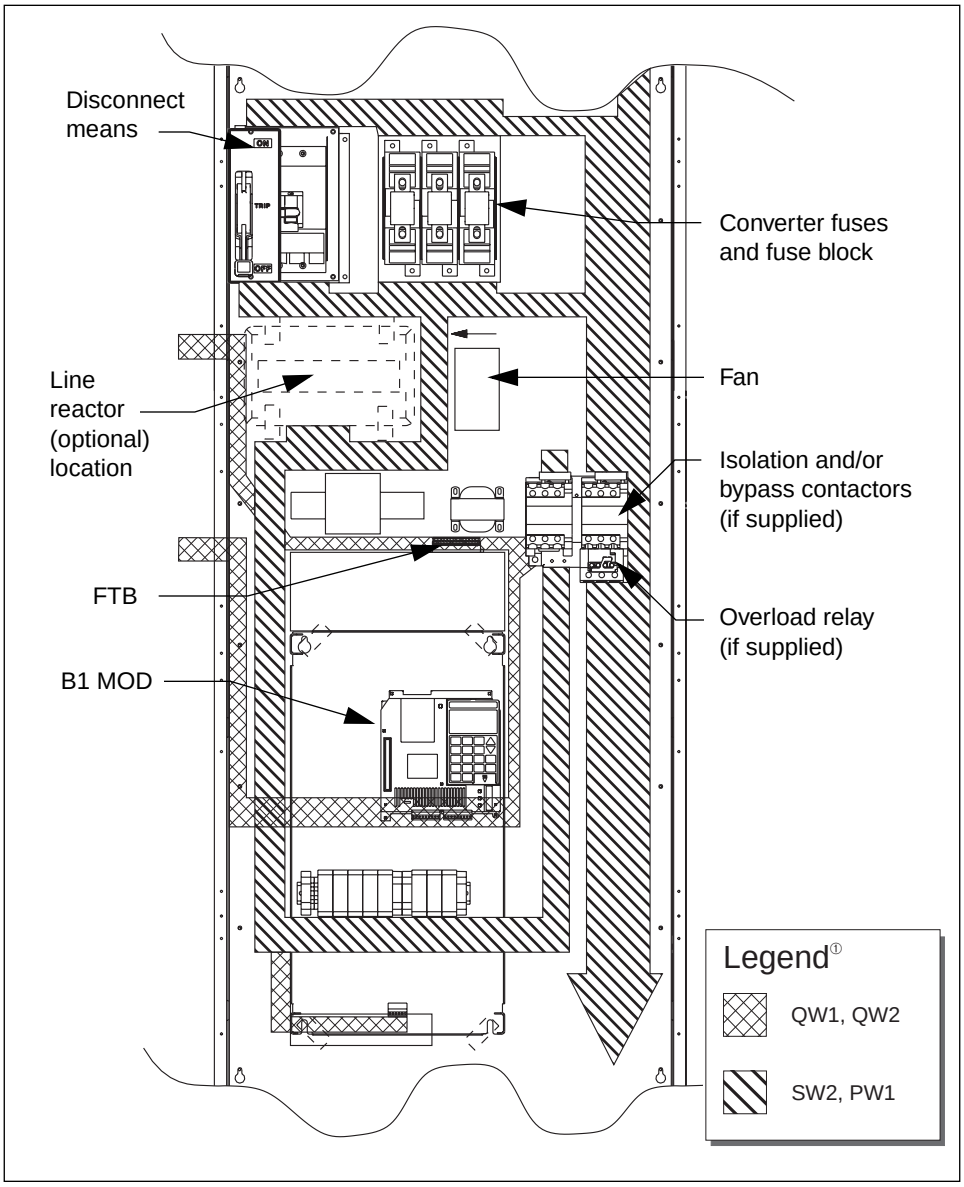

Figure 14: Field Wire Termination for Frame Size 5, Altivar Frequency Controller with Extended Options in MCCs
(Table 11 on page 28)
50–75 HP at 460 Vac, Constant Torque (CT)
and Variable Torque Low Noise (VTLN)
60–100 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to "WIRE ROUTING AND INTERCONNECTION" on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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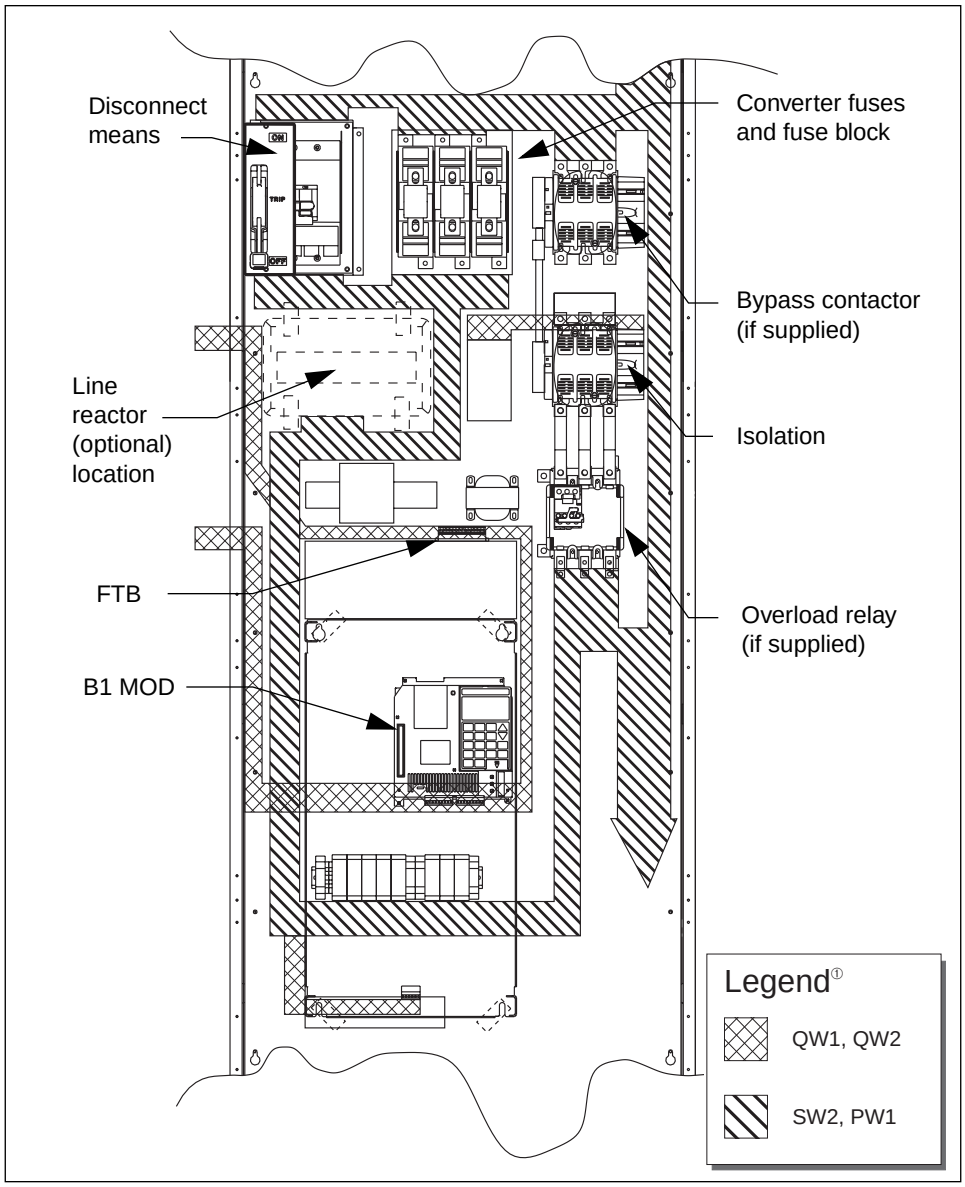

Figure 15: Field Wire Termination for Frame Size 5 Altivar Frequency Controller with Extended Options in MCCs (Table 11 on page 28)
50–75 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
60–100 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to "WIRE ROUTING AND INTERCONNECTION" on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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Table 12: Field Wire Termination Chart for Basic Frame Size 6 ALTIVAR Adjustable Frequency Controller in MCCs (see Figure 16 on page 32)
100–200 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
125–200 HP at 460 Vac, Variable Torque (VT)

Termination Designation	Device	Torque (lb-in/N•m)	Maximum Wire Size (AWG/mm^2)	Wire Class	Noise Class	Voltage Class	Applicable HP Ratings
T1, T2, T3	Converter Fuse Block	148 / 16.8	250 kcmil	N/A	SW2	600 V	All
L1, L2, L3	Power Converter	325 / 36.7	350 kcmil / 185	75° C CU	SW2	600 V	100–125 HP
		375 / 42.4	2–300 kcmil / 2–150	75° C CU	SW2	600 V	150–200 HP
T1, T2, T3	Power Converter	325 / 36.7	350 kcmil / 185	75° C CU	PW1	600 V	All
PA, PB	Power Converter	50 / 5.6	1/0 / 50	75° C CU	PW1	600 V	All
Any	Power Converter J1	3.5 /0.4	#14 / 1.5	75° C CU	SW1	150 V / 300 V	All
Any	Power Converter J12, J22, J24	3.5 / 0.4	#14 / 1.5	75° C CU	QW2	30 V	All
Any	Power Converter J13, J23	3.5 / 0.4	#14 / 1.5	75° C CU	QW1	30 V	All
X1, X2, S1, S2, 1, 2, 3 through n	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	SW1	150 V	All
C1, C2, C3 through Cn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW1	30 V	All
D1, D2, D3 through Dn	Terminal Block FTB	5 / 0.57	#14 / 1.5	75° C CU	QW2	30 V	All

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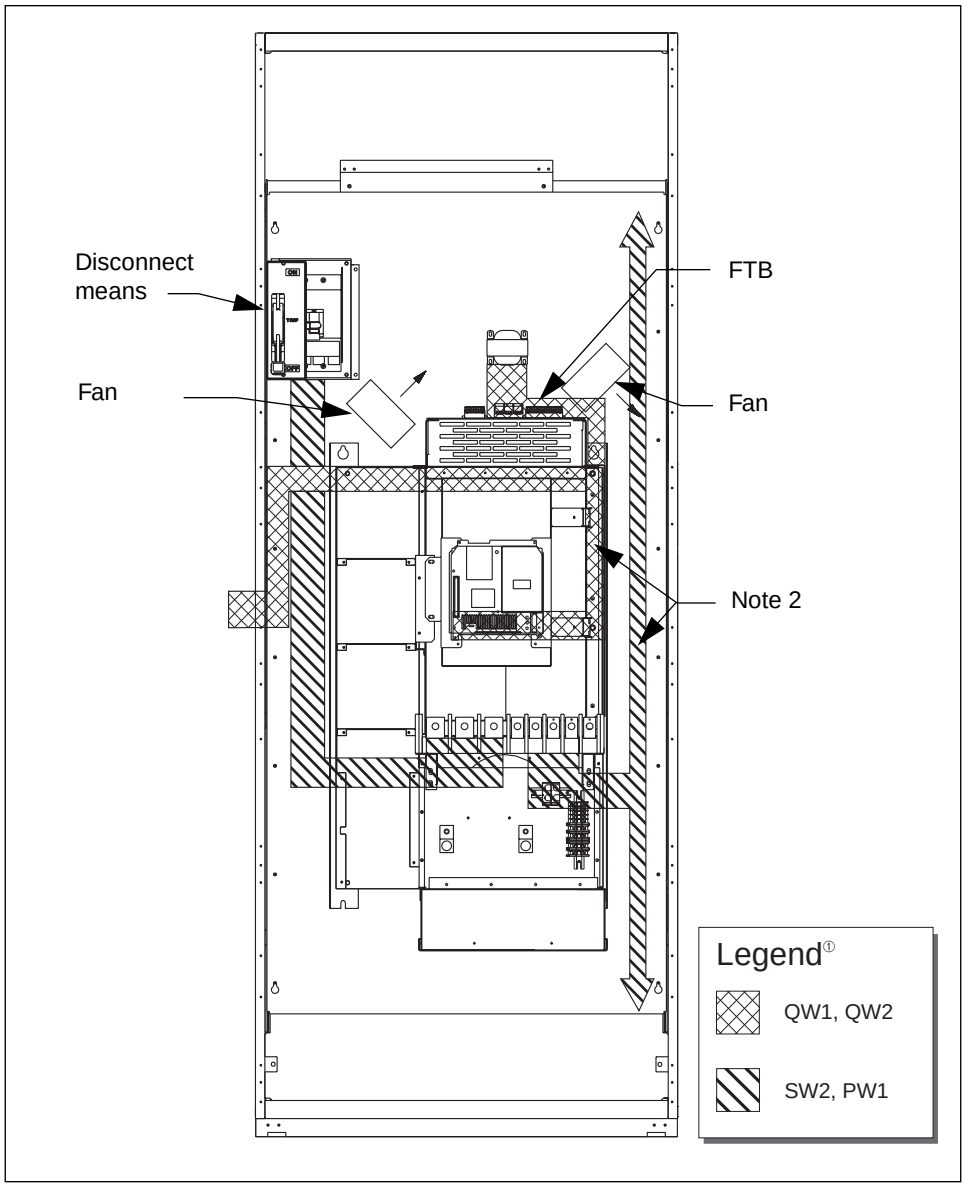

Figure 16: Field Wire Termination for Basic Frame Size 6 ALTIVAR Adjustable Frequency Controller in MCCs
(Table 12 on page 31)
100–200 HP at 460 Vac, Constant Torque (CT)
125–200 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to “WIRE ROUTING AND INTERCONNECTION” on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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Table 13: Field Wire Termination for Frame Size 6 ALTIVAR 66 Frequency Controller with Extended Options in MCCs (see Figure 17 on page 34)
100–200 HP at 460 Vac, Constant Torque (CT) and Variable Torque Low Noise (VTLN)
125–200 HP at 460 Vac, Variable Torque (VT)

Termination Designation	Device	Torque (lb-in/N•m)	Maximum Wire Size (AWG/mm^2)	Wire Class	Noise Class	Voltage Class	Applicable HP Ratings
T1, T2, T3	Converter Fuse Block	148 / 16.8	N/A	75° C CU-AL	SW2	600 V	All Above
L1, L2, L3	Power Converter	325 / 36.7	350 kcmil / 185	75° C CU	SW2	600 V	All Above
		375 / 42.4	2–300 kcmil / 2–150	75° C CU	SW2	600 V	All Above
T1, T2, T3	Power Converter	325 / 36.7	350 kcmil / 185	75° C CU	PW1	600 V	All Above
PA, PB	Power Converter	50 / 5.6	1/0 / 50	75° C CU	PW1	600 V	All Above
T1, T2, T3	Iso/Bypass Starter or Isolation Contactor (if applicable)	158 / 18	3/0 / —	75° C CU	PW1	600 V	100–150 HP
		308 / 35	250 kcmil / —	75° C CU	PW1	600 V	200 HP
L1, L2, L3	Line Contactor (if applicable)	158 / 18	2/0 / —	75° C CU	SW2	600 V	100 HP
		308 / 35	250 kcmil / —	75° C CU	SW2	600 V	125–200 HP
Any	Power Converter J1	3.5 /0.4	#14 / 2.5	75° C CU	SW1	150 V / 300 V	All Above
Any	Power Converter J12, J22, J24	3.5 / 0.4	#14 / 2.5	75° C CU	QW2	30 V	All Above
Any	Power Converter J13, J23	3.5 / 0.4	#14 / 2.5	75° C CU	QW1	30 V	All Above
X1, X2, S1, S2, 1, 2, 3 through n	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	SW1	150 V	All Above
C1, C2, C3 through Cn	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	QW1	30 V	All Above
D1, D2, D3 through Dn	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	QW2	30 V	All Above

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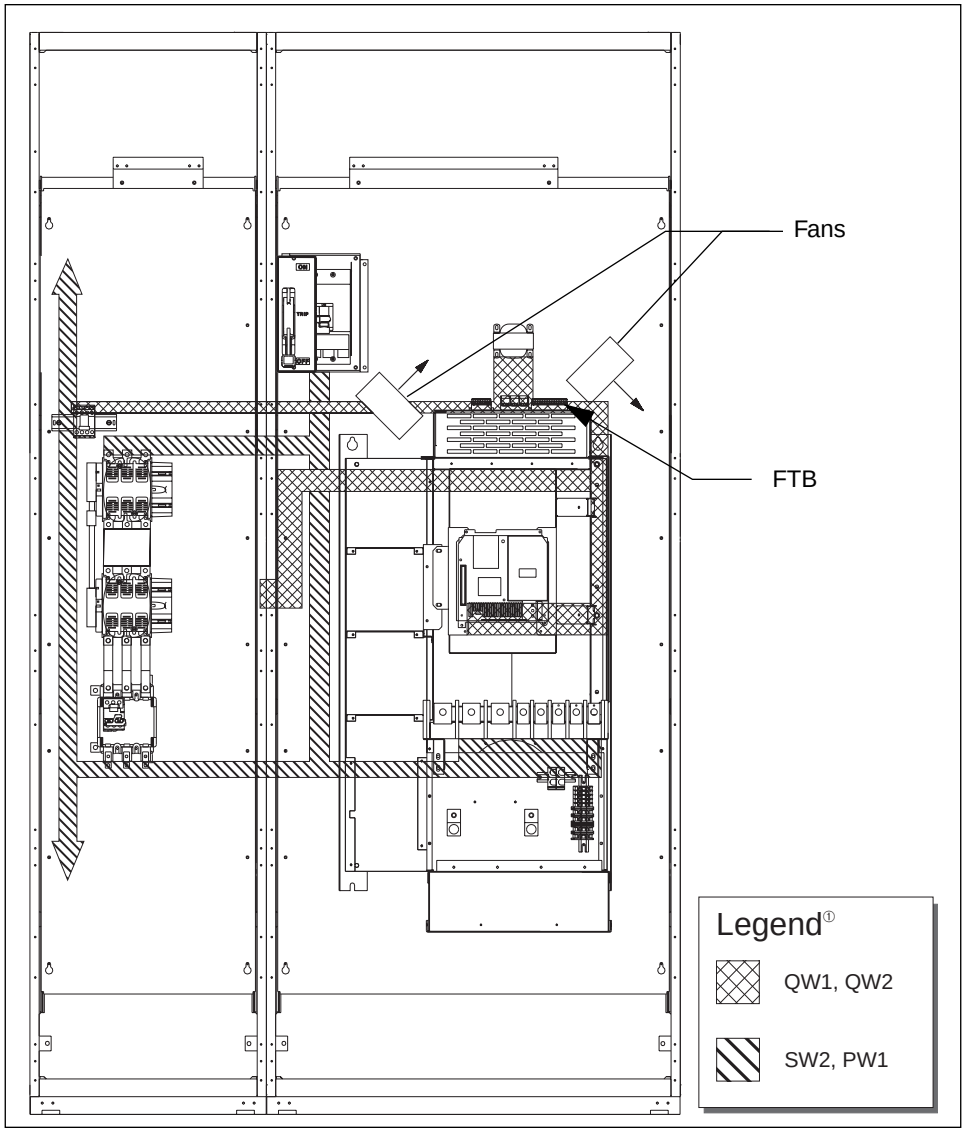

Figure 17: Field Wire Termination for Frame Size 6 ALTIVAR 66 Adjustable Frequency Controller with Extended Options in MCCs (Table 13 on page 33)
100–200 HP at 460 Vac, Constant Torque (CT)
125–200 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to “WIRE ROUTING AND INTERCONNECTION” on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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Table 14: Field Wire Termination for Frame Size 7 ALTIVAR 66 Frequency Controller with Extended Options in MCCs (see Figure 18 on page 36 and Figure 19 on page 37)
250–350 HP at 460 Vac, Constant Torque (CT)
250–400 HP at 460 Vac, Variable Torque (VT)

Termination Designation	Device	Torque (lb-in/N•m)	Maximum Wire Size (AWG/mm^2)	Wire Class	Noise Class	Voltage Class	Applicable HP Ratings
T1, T2, T3	Power Converter	375 / 42.4	3–500 kcmil / 185	75° C CU	PW1	600 V	All
PA, PB	Power Converter	375 / 42.4	3X500 kcmil	75° C CU	PW1	600 V	All
Any	Power Converter J1	3.5 /0.4	#14 / 2.5	75° C CU	SW1	150 V / 300 V	All
Any	Power Converter J12, J22, J24	3.5 / 0.4	#14 / 2.5	75° C CU	QW2	30 V	All
Any	Power Converter J13, J23	3.5 / 0.4	#14 / 2.5	75° C CU	QW1	30 V	All
X1, X2, S1, S2, 1, 2, 3 through n	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	SW1	150 V	All
C1, C2, C3 through Cn	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	QW1	30 V	All
D1, D2, D3 through Dn	Terminal Block FTB	5 / 0.57	#14 / 2.5	75° C CU	QW2	30 V	All

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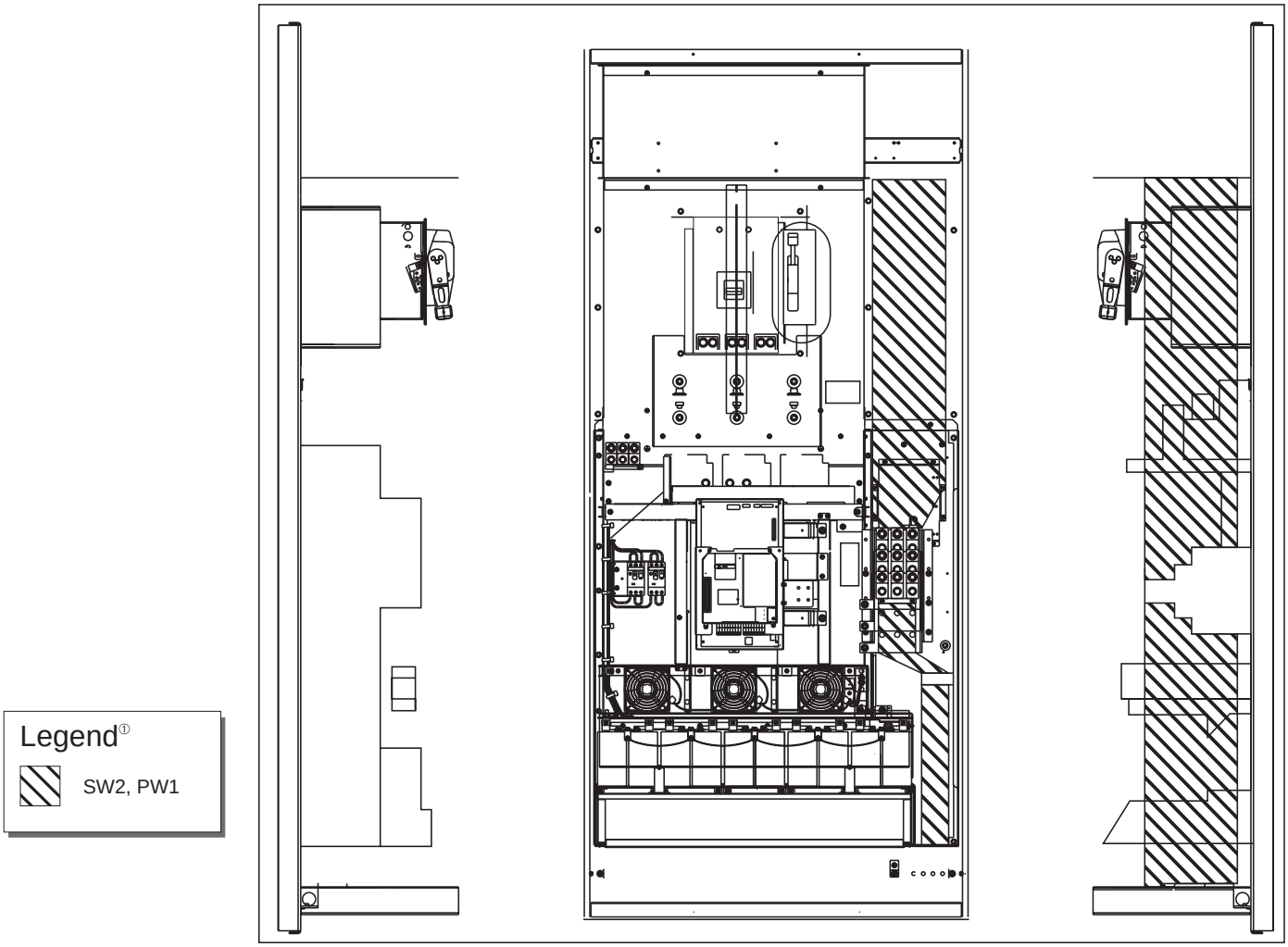

Figure 18: Field Power Wire Termination for Basic Frame Size 7 ALTIVAR 66 Adjustable Frequency Controller in MCCs (Table 14 on page 35)
250–350 HP at 460 Vac, Constant Torque (CT)
250–400 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to “WIRE ROUTING AND INTERCONNECTION” on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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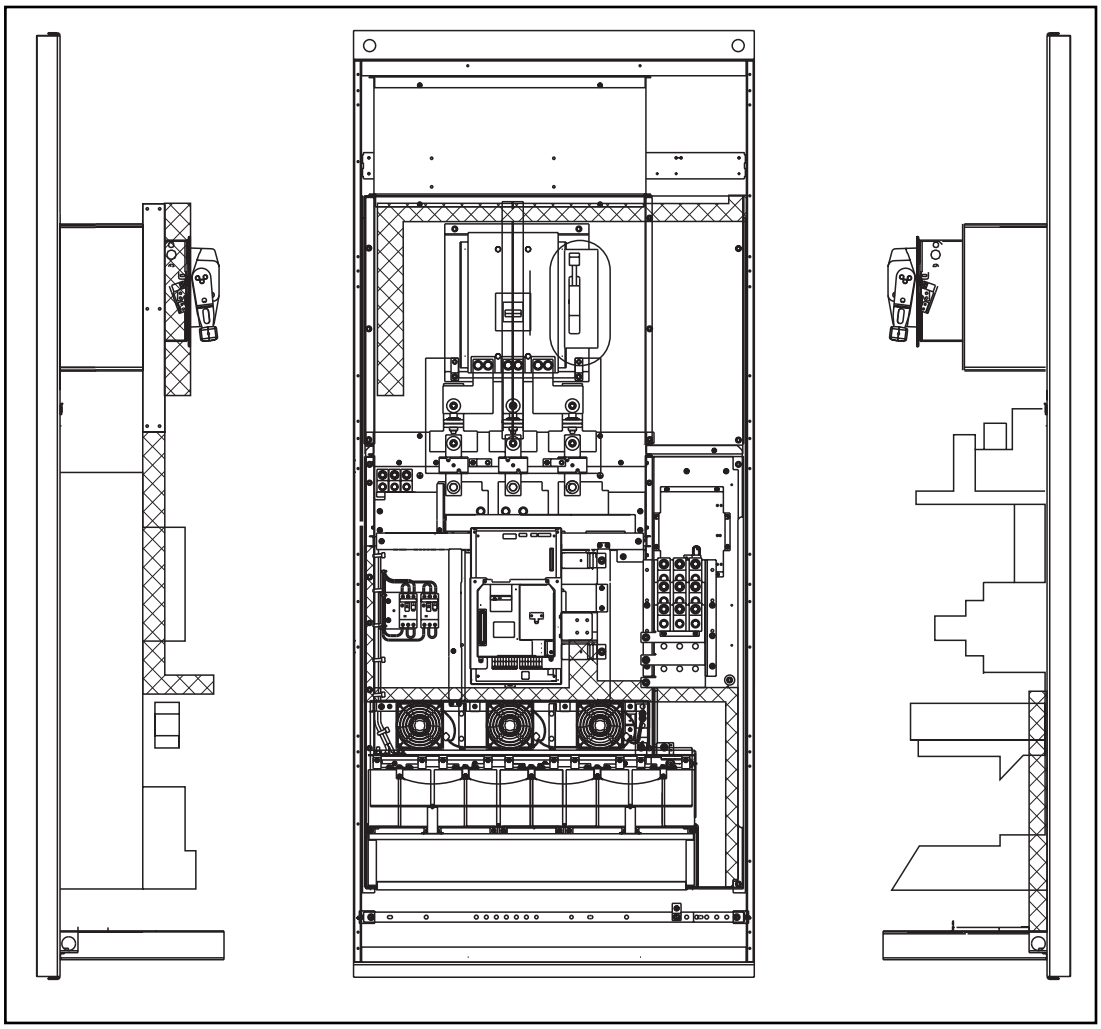

Figure 19: Field Control Wire Termination for Basic Frame Size 7 ALTIVAR 66 Adjustable Frequency Controller in MCCs (Table 14 on page 35)
250–350 HP at 460 Vac, Constant Torque (CT)
250–400 HP at 460 Vac, Variable Torque (VT)

Notes:

① For description, refer to “WIRE ROUTING AND INTERCONNECTION” on page 8.

② Arrange conductor groups depth-wise within the unit and structure to maximize separation of each noise class.

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MAINTENANCE LOG

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